

MOSFETs Silicon N-Channel MOS (U-MOSVII)

# **TPCA8081**

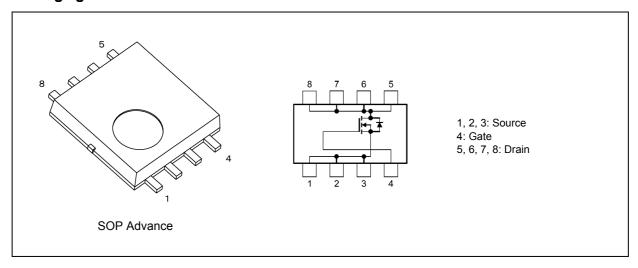
#### 1. Applications

- · Notebook PCs
- · Mobile Handsets

#### 2. Features

- (1) Small footprint due to a small and thin package
- (2) Low drain-source on-resistance:  $R_{DS(ON)} = 2.3 \text{ m}\Omega$  (typ.) ( $V_{GS} = 10 \text{ V}$ )
- (3) Low leakage current:  $I_{DSS} = 10 \mu A \text{ (max) (V}_{DS} = 30 \text{ V)}$
- (4) Enhancement mode:  $V_{th}$  = 1.3 to 2.3 V ( $V_{DS}$  = 10 V,  $I_D$  = 0.5 mA)

### 3. Packaging and Internal Circuit



### 4. Absolute Maximum Ratings (Note) (Ta = 25°C unless otherwise specified)

Characteristics				Rating	Unit
Drain-source voltage			V <sub>DSS</sub>	30	V
Gate-source voltage			V <sub>GSS</sub>	±20	
Drain current (DC)		(Note 1)	I <sub>D</sub>	38	Α
Drain current (pulsed)		(Note 1)	I <sub>DP</sub>	114	
Power dissipation	(T <sub>c</sub> = 25°C)		P <sub>D</sub>	52	W
Power dissipation	(t = 10 s)	(Note 2)	P <sub>D</sub>	2.8	W
Power dissipation	(t = 10 s)	(Note 3)	P <sub>D</sub>	1.6	W
Single-pulse avalanche energy		(Note 4)	E <sub>AS</sub>	187	mJ
Avalanche current			I <sub>AR</sub>	38	Α
Channel temperature			T <sub>ch</sub>	150	℃
Storage temperature			T <sub>stg</sub>	-55 to 150	1

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).



#### 5. Thermal Characteristics

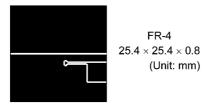
Characteristics				Max	Unit
Channel-to-case thermal resistance	$(T_c = 25^{\circ}C)$		R <sub>th(ch-c)</sub>	2.4	°C/W
Channel-to-ambient thermal resistance	(t = 10 s)	(Note 2)	R <sub>th(ch-a)</sub>	44.6	
Channel-to-ambient thermal resistance	(t = 10 s)	(Note 3)	R <sub>th(ch-a)</sub>	78.1	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: Device mounted on a glass-epoxy board (a), Figure 5.1

Note 3: Device mounted on a glass-epoxy board (b), Figure 5.2

Note 4:  $V_{DD}$  = 24 V,  $T_{ch}$  = 25°C (initial), L = 0.1 mH,  $R_G$  = 1  $\Omega$ ,  $I_{AR}$  = 38 A



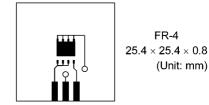


Fig. 5.1 Device Mounted on a Glass-Epoxy Board (a)

Fig. 5.2 Device Mounted on a Glass-Epoxy Board (b)

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.



### 6. Electrical Characteristics (T<sub>a</sub> = 25°C unless otherwise specified)

### 6.1. Static Characteristics

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current	I <sub>GSS</sub>	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±0.1	μА
Drain cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V	_	_	10	
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	30			V
	V <sub>(BR)DSX</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = -20 V	15			
Gate threshold voltage	$V_{th}$	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.5 mA	1.3	_	2.3	
Drain-source on-resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 19 A		3.0	3.8	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 19 A	_	2.3	3.0	

### 6.2. Dynamic Characteristics

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	_	3600	_	pF
Reverse transfer capacitance	C <sub>rss</sub>		_	200	_	
Output capacitance	C <sub>oss</sub>		_	680	_	
Switching time (rise time)	t <sub>r</sub>	See Figure 6.2.1.	_	4.3	_	ns
Switching time (turn-on time)	t <sub>on</sub>		_	13	_	
Switching time (fall time)	t <sub>f</sub>	]	_	6.9	_	
Switching time (turn-off time)	t <sub>off</sub>		_	48		

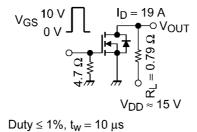


Fig. 6.2.1 Switching Time Test Circuit

### 6.3. Gate Charge Characteristics

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	$V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 38 \text{ A}$	_	51	_	nC
Gate-source charge 1	Q <sub>gs1</sub>			11		
Gate-drain charge	$Q_{gd}$		_	6.4	_	

### 6.4. Source-Drain Characteristics

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Pulsed reverse drain current (Note 5	l <sub>DRP</sub>	_	_		114	Α
Diode forward voltage	V <sub>DSF</sub>	I <sub>DR</sub> = 38 A, V <sub>GS</sub> = 0 V			-1.2	V

Note 5: Ensure that the channel temperature does not exceed 150°C.



# 7. Marking

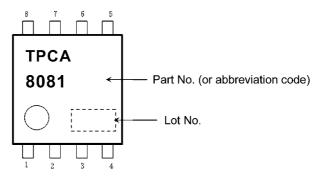


Fig. 7.1 Marking

### 8. Characteristics Curves (Note)

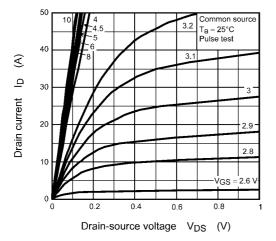


Fig. 8.1 I<sub>D</sub> - V<sub>DS</sub>

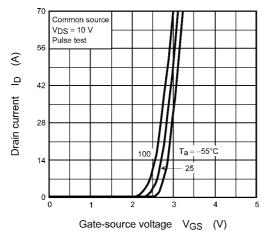


Fig. 8.3 I<sub>D</sub> - V<sub>GS</sub>

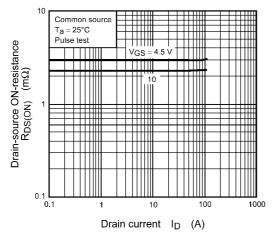


Fig. 8.5 R<sub>DS(ON)</sub> - I<sub>D</sub>

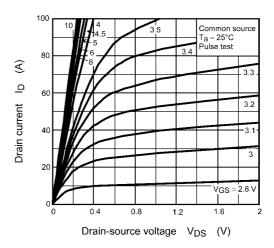


Fig. 8.2 I<sub>D</sub> - V<sub>DS</sub>

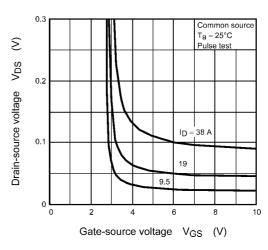


Fig. 8.4 V<sub>DS</sub> - V<sub>GS</sub>

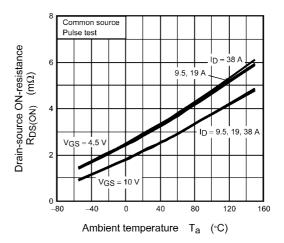


Fig. 8.6 RDS(ON) - Ta

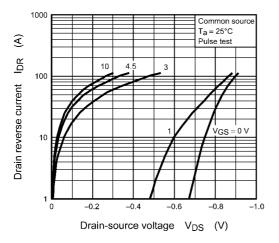


Fig. 8.7 IDR - VDS

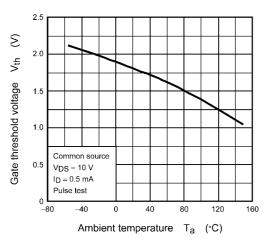


Fig. 8.9 V<sub>th</sub> - T<sub>a</sub>

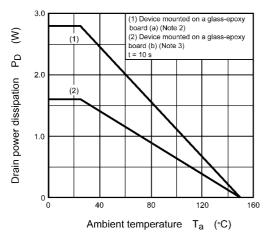


Fig. 8.11 P<sub>D</sub> - T<sub>a</sub> (Guaranteed Maximum)

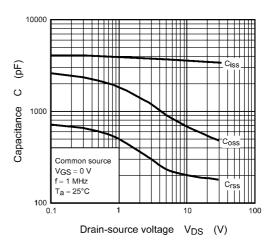


Fig. 8.8 Capacitance - V<sub>DS</sub>

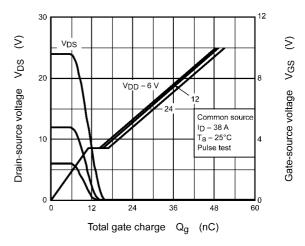


Fig. 8.10 Dynamic Input/Output Characteristics

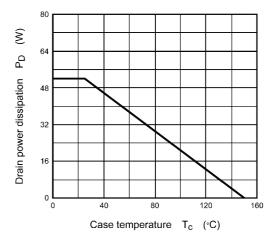


Fig. 8.12 P<sub>D</sub> - T<sub>c</sub> (Guaranteed Maximum)

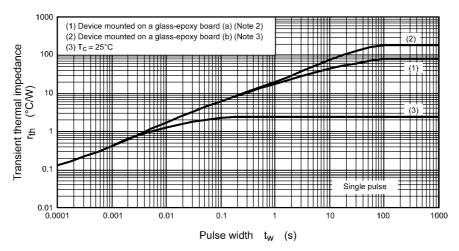


Fig. 8.13 r<sub>th</sub> - t<sub>w</sub> (Guaranteed Maximum)

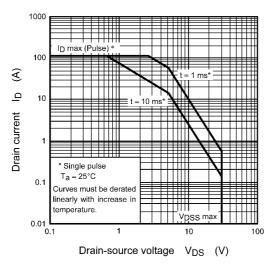


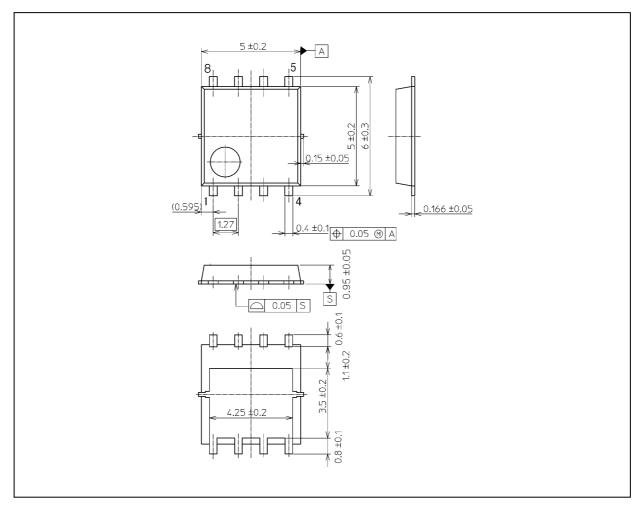
Fig. 8.14 Safe Operating Area (Guaranteed Maximum)

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



## **Package Dimensions**

Unit: mm



Weight: 0.069 g (typ.)

Package Name(s)	
TOSHIBA: 2-5Q1S	
Nickname: SOP Advance	



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